



MATERIAL CHARACTERIZATION INSTRUMENTATION AND FACILITIES

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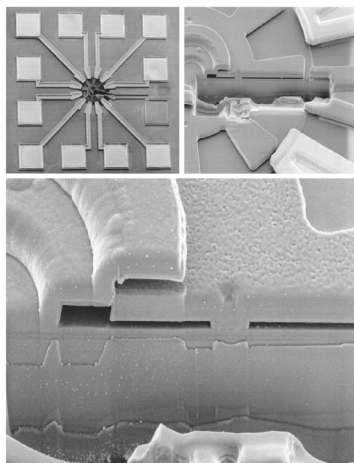
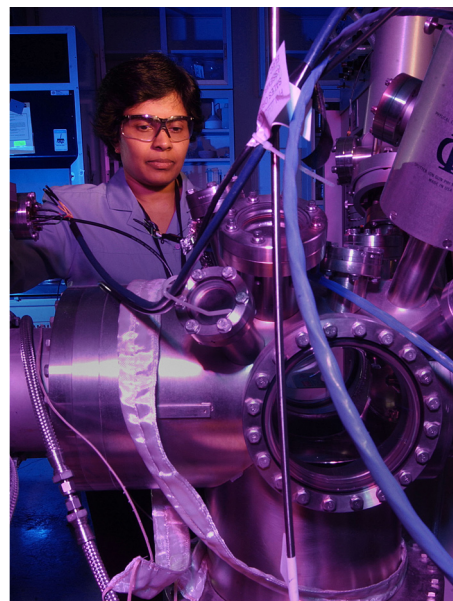
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Background

The components that make up power generation and power distribution systems, sorbents for fuel gas contaminant removal, catalysts for reforming and chemical selectivity, sensor devices and device structures, etc. are all solid materials. In order to develop and/or study these and other materials, the ability to conduct surface, near surface and bulk solids material characterization is essential.

Capabilities

The National Energy Technology Laboratory (NETL) maintains some basic material characterization/analytical capabilities for the purpose of conducting materials characterization for energy and environmental related research and development activities.



Scanning Electron and Scanning Probe Microscopy

- Determination of surface morphology, surface structure and surface properties: image processing and analysis
- Determination of elemental composition and distribution (through interfaced X-Ray microanalysis system)
- Variable temperature *in-situ* analysis capabilities
- *In-situ* gas exposure capabilities for the study of gas solid interactions



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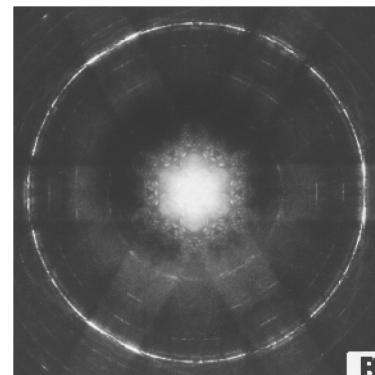
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X-Ray Photoelectron Spectroscopy and Auger Electron Microscopy

- Determination of surface elemental and chemical composition
- Gas exposure capabilities for the study of gas/solid interactions
- High temperature capabilities

X-Ray Diffraction

- Phase determination
- Crystal structure determination
- Determination of crystallite size, defects, bond lengths
- High temperature capabilities



Fourier Transform Infrared Spectroscopy

- Chemical characterization and determination of structural changes
- Determination of reaction mechanisms
- High temperature diffuse reflectance capabilities
- *In-situ* high temperature and gas exposure capabilities (DRIFT)

Thermogravimetric Analysis Systems

- Determination of chemical kinetics
- Extent and characterization of gas/solid interactions
- High temperature and high pressure capabilities

Differential Scanning Calorimetry

- Determination of physical and thermodynamic properties
- Gas/solid interaction capabilities

Other Analytical Capabilities for Physical and Chemical Characterization of Materials

Physical Characterization

- Particle Size Analyzer
- BET Surface Area and Pore Volume Analyzer
- Helium Density Analyzer
- LECO Calorimeter
- Specific Gravity Meter
- Viscometers

Chemical Analysis

- Atomic Absorption Spectroscopy
- Inductively Coupled Plasma
- X-Ray Fluorescence
- C,H,N Analyzer
- Gas Chromatography
- Nuclear Magnetic Resonance
- Mass Spectroscopy
- Mass Spectroscopy Moisture, Ash and Volatile Matter Analyzer
- LECO Sulfur Analyzer
- Volumetric Absorption Apparatus